

WHAT IS CLAIMED IS:

1. A voltage level shifter comprising:

a level changer having a current block and a first transistor, in which an input signal having amplitude between  
5 a reference potential and a potential of a low voltage power supply higher than the reference potential is inputted into a gate of the first transistor, a high voltage power supply higher than the potential of the low voltage power supply or the current block is connected to a source or a drain of the first transistor,  
10 and the level changer outputs a potential of the high voltage power supply or the reference potential by a potential of the input signal inputted into the first transistor; and

an output circuit for outputting an output signal having amplitude between the reference potential and the potential of  
15 the high voltage power supply when a signal from an output end of the level changer is inputted thereto.

2. The voltage level shifter according to claim 1,

wherein the current block includes a second transistor  
20 in which a source is connected to the reference potential, a drain is connected to the source or the drain of the first transistor, and a gate is connected to the low voltage power supply.

25 3. The voltage level shifter according to claim 1,

wherein the level changer comprises:

a first input circuit capable of operating by the low voltage power supply, the input signal having the amplitude between the reference potential and the potential of the low voltage power supply higher than the reference potential being  
5 inputted into the first input circuit;

a second input circuit capable of operating by the low voltage power supply, an output of the first input circuit being inputted into the second input circuit;

a first N-channel MOSFET, a gate thereof being connected  
10 to an output of the first input circuit;

a second N-channel MOSFET, a gate thereof being connected to an output of the second input circuit;

a first P-channel MOSFET, in which a source thereof is connected to the high voltage power supply having a potential  
15 higher than the potential of the low voltage power supply, a drain is connected to a drain of the first N-channel MOSFET, and a gate is connected to a drain of the second N-channel MOSFET;

a second P-channel MOSFET, in which a source thereof is connected to the high voltage power supply, a drain is connected  
20 to the drain of the second N-channel MOSFET and is set to be the output end of the level changer, and a gate is connected to the drain of the first N-channel MOSFET; and

the current block comprising a third N-channel MOSFET in which a source thereof is connected to the reference potential,  
25 a drain is connected to a source of the first N-channel MOSFET, and a gate is connected to the low voltage power supply; and

a fourth N-channel MOSFET in which a source thereof is connected to the reference potential, a drain is connected to a source of the second N-channel MOSFET, and a gate is connected to the low voltage power supply.

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4. The voltage level shifter according to claim 1, further comprising a retaining circuit for retaining the output end of the level changer at the potential of the high voltage power supply or the reference potential.

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5. The voltage level shifter according to claim 4, further comprising an output retainer including the output circuit and the retaining circuit,

wherein the retaining circuit of the output retainer is connected between an output end of the output circuit and the output end of the level changer and is a feedback circuit for returning an output of the output circuit to the output end of the level changer.

20 6. The voltage level shifter according to claim 5,

wherein both the output circuit and the feedback circuit include CMOS inverters.

7. The voltage level shifter according to claim 4,

25 wherein time required for the returning by the output circuit and the feedback circuit is shorter than time for output

transition of the level changer.

8. A system mounting a voltage level shifter therein, the system comprising a peripheral circuit, the voltage level shifter  
5 connected to the peripheral circuit, and an internal circuit connected to the level shifter,

wherein the voltage level shifter comprises:

a level changer having a current block and a first transistor, in which an input signal having amplitude between  
10 a reference potential and a potential of a low voltage power supply higher than the reference potential is inputted into a gate of the first transistor from the peripheral circuit, a high voltage power supply higher than the potential of the low voltage power supply or a current block is connected to a source or a  
15 drain of the first transistor, and the level changer outputs a potential of the high voltage power supply or the reference potential by a potential of the input signal inputted into the first transistor; and

an output circuit for outputting an output signal having  
20 amplitude between the reference potential and the potential of the high voltage power supply to the internal circuit when a signal from an output end of the level changer is inputted thereto.

9. The system according to claim 8,

25 wherein the internal circuit is supplied with the potential of the high voltage power supply, and the peripheral circuit

is supplied with the potential of the low voltage power supply.

10. The system according to claim 9,

wherein the peripheral circuit has a system operation  
5 period and a standby period, in which the potential of the low  
voltage power supply supplied to the peripheral circuit is  
switched to the reference potential and the potential of the  
low voltage power supply supplied to the voltage level shifter  
is switched to the reference potential during the standby period.

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11. The system according to claim 8,

wherein the current block includes a second transistor  
in which a source is connected to the reference potential, a  
drain is connected to the source or the drain of the first  
15 transistor, and a gate is connected to the low voltage power  
supply.

12. The system according to claim 8,

wherein the level changer comprises:

20 a first input circuit capable of operating by the low  
voltage power supply, the input signal having the amplitude  
between the reference potential and the potential of the low  
voltage power supply higher than the reference potential being  
inputted into the first input circuit;

25 a second input circuit capable of operating by the low  
voltage power supply, an output of the first input circuit being

inputted into the second input circuit;

a first N-channel MOSFET, a gate thereof being connected to an output of the first input circuit;

a second N-channel MOSFET, a gate thereof being connected  
5 to an output of the second input circuit;

a first P-channel MOSFET, in which a source thereof is connected to the high voltage power supply having a potential higher than the potential of the low voltage power supply, a drain is connected to a drain of the first N-channel MOSFET,  
10 and a gate is connected to a drain of the second N-channel MOSFET;

a second P-channel MOSFET, in which a source thereof is connected to the high voltage power supply, a drain is connected to the drain of the second N-channel MOSFET and is set to be the output end of the level changer, and a gate is connected  
15 to the drain of the first N-channel MOSFET; and

the current block comprising a third N-channel MOSFET in which a source thereof is connected to the reference potential, a drain is connected to a source of the first N-channel MOSFET, and a gate is connected to the low voltage power supply; and  
20 a fourth N-channel MOSFET in which a source thereof is connected to the reference potential, a drain is connected to a source of the second N-channel MOSFET, and a gate is connected to the low voltage power supply.

25 13. The system according to claim 8,

wherein the level shifter further comprises a retaining

circuit for retaining the output end of the level changer at the potential of the high voltage power supply or the reference potential.

5 14. The system according to claim 13,

wherein the level shifter further comprises an output retainer including the output circuit and the retaining circuit, and

the retaining circuit of the output retainer is connected  
10 between an output end of the output circuit and the output end of the level changer and is a feedback circuit for returning an output of the output circuit to the output end of the level changer.

15 15. The system according to claim 14,

wherein both the output circuit and the feedback circuit include CMOS inverters.

16. The system according to claim 14,

20 wherein time required for the returning by the output circuit and the feedback circuit is shorter than time for output transition of the level changer.

17. The system according to claim 8, comprising a microcomputer

25 including the voltage level shifter and the internal circuit.